Dr Michael Brown, of the California Institute of Technology, and the team who discovered the planet have nicknamed it Xena, after the warrior played by New Zealand actor Lucy Lawless in the TV series, "because we always wanted to name something Xena". The **International Astronomical Union** has to approve this name, and this seems unlikely. It's considered bad taste to name a celestial body after a TV cult figure. The new planet is cold: on a good day, it might touch -240 Centigrade. At a distance of 97 **Astronomical Units**, its year is about 560 Earth years long. Xena is in a highly **elliptical orbit** inclined about 45 degrees from the **main plane** of our Solar System. Currently it's near **aphelion** at some 9 billion miles from the center of the Solar System. Its **perihelion** distance is 38 A.U., or some 3.5 billion miles, during a 557-year orbit. By contrast, Pluto's mean distance from the Sun is just 39 A.U., or 3.6 billion miles, and it orbits in just 248.5 years. The new world is thought to be about 2,800 miles in diameter, roughly 1.5 times as large as Pluto. **Infrared spectroscopy** indicates that, like Pluto, it has **methane ice** on its surface. Like Pluto, the new planet is a member of the **Kuiper Belt**, a swarm of icy bodies beyond Neptune in orbit around the sun. The discovery of a moon nicknamed Gabrielle means Xena has at least enough mass to keep a satellite. Gabrielle is estimated to orbit close to Xena, making a circuit perhaps every 14 days.

For now, the planet is officially just called by its catalog number: 2003UB313 or UB313 for short. For various technical reasons, it may not even be a 'real' **planet** even though it is bigger then Pluto. Astronomers are still debating what a planet really is and how to define one unambiguously. Pluto may not be a planet if a more stringent definition is eventually adopted. More info at http://www.gps.caltech.edu/~mbrown/planetlila/ . The picture below is courtesy John Chumak (DIRAS Observatory).

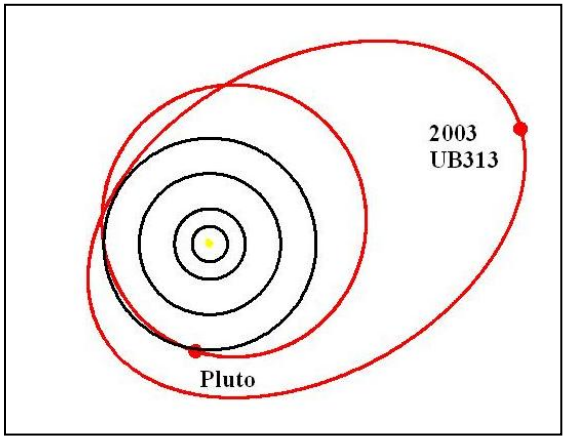
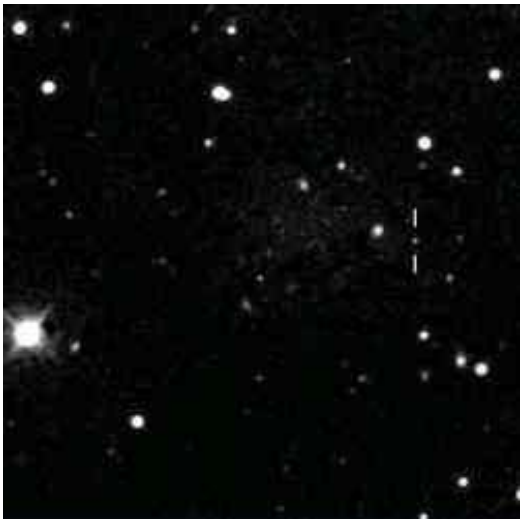


Diagram showing orbits of Pluto and Xena (red) and Jupiter, Saturn, Uranus, Neptune (black)



Define the terms highlighted in the article above.

Question 1 – How are planets and other astronomical objects named?

Question 2 – How many different definitions for a planet can you find in textbooks or on the internet?

Question 3 – What are the pros and cons of identifying UB313 as a planet? Remember to cite resources you use (e.g. provide a bibliography)

Define the terms highlighted in the article.

International Astronomical Union – An official community of astronomers who make decisions about naming stars, planets and features on planets and satellites, and who also organize international research programs in astronomy.
Astronomical Unit – The distance from Earth to the Sun defined as 1.00 but equal to 149 million kilometers.
elliptical orbit – The path that a planet or other small body takes as it orbits the sun.
main plane – The orbits of the planets are located very close to an imaginary plane that slices the sun in half along its equator. This is the main or 'principal' plane of the solar system.
aphelion – A body's farthest distance from the sun.
perihelion – A body's closest distance to the sun.
infrared spectroscopy – A method used by astronomers to break the infrared light from an astronomical body, and study the fingerprints of various molecules in the infrared part of the electromagnetic spectrum.
methane ice – Methane is normally found in a gaseous state on Earth, but when cooled to below -182 Centigrade, it freezes into ice form.
Kuiper Belt – A large population of small to planet-sized bodies orbiting the sun at distances beyond the orbit of Neptune.
planet – A large body at least as big as Pluto, that orbits its star, that was formed soon after its star out of the same primordial material, and that is not found within regions where 'rubble' currently exists (i.e. asteroid belt or Kuiper Belt).

Question 1 – How are planets and other astronomical objects named? **Answer:** IAU rules specify themes for naming planetoids: for example, all planetoids in Pluto-like orbits ("plutinos") are to be named after creation deities (such as 50000 Quaoar, named after the god Quaoar of the Native American Tongva people, and 90377 Sedna, named after the god Sedna in Inuit mythology). Under IAU rules, all asteroid names must be no more than 18 letters long and preferably one word (like 5535 Annefrank). Military and political leaders must be dead for over 100 years before their names can be used.

Question 2 – How many different definitions for a planet can you find in textbooks or on the internet? Sample answers may include:
1- Orbits the sun as an independent body
2- Shines only by reflected sunlight.
3- Is larger than the smallest established planet: Pluto
4- Orbits the sun in the same orbital plane as the other planets.

Question 3 – What are the pros and cons of identifying UB313 as a planet?

Answer: Because this is a very open-ended question in astronomy, students are free to answer as best they can but should cite any resource or expert opinion they use. Pros could include the fact that it is bigger than Pluto and orbits the sun as an independent body, so it would be consistent with how other planets were identified. Cons could include the fact that its orbit is very different than the major planets Mercury-Neptune, and more similar to cometary or Kuiper Belt objects.